

Assessment criteria

How the project is assessed

Each project should be assessed against the following seven criteria.

Criterion A	Introduction
Criterion B	Information/measurement
Criterion C	Mathematical processes
Criterion D	Interpretation of results
Criterion E	Validity
Criterion F	Structure and communication
Criterion G	Commitment

Descriptions of the achievement levels for each of these seven assessment criteria appear in the *Mathematical Studies SL* guide and are reproduced here for ease of reference. Instructions for applying the criteria are also included in the guide. It is particularly important to note that each achievement level represents the **minimum** requirement for that level to be awarded.

The final mark for each project is obtained by adding together the achievement levels awarded for each criterion A–G. The maximum possible mark is 20.

Achievement levels

Criterion A: Introduction

In this context, the word “task” is defined as “what the student is going to do”; the word “plan” is defined as “how the student is going to do it”. A statement of the task should appear at the beginning of each project. It is expected that each project has a clear title.

Achievement level	Descriptor
0	The student does not produce a clear statement of the task. <i>There is no evidence in the project of any statement of what the student is going to do or has done.</i>
1	The student produces a clear statement of the task. <i>For this level to be achieved the task should be stated explicitly.</i>
2	The student produces a title, a clear statement of the task and a clear description of the plan. <i>The plan need not be highly detailed, but must describe how the task will be performed.</i>

Criterion B: Information/Measurement

In this context, generated measurements include those that have been generated by computer, by observation, by investigation, by prediction from a mathematical model or by experiment. Mathematical information includes geometrical figures and data that is collected empirically or assembled from outside sources. This list is not exclusive and mathematical information does not solely imply data for statistical analysis.

Achievement level	Descriptor
0	<p>The student does not collect relevant information or generate relevant measurements.</p> <p><i>No attempt has been made to collect any relevant information or generate any relevant measurements.</i></p>
1	<p>The student collects relevant information or generates relevant measurements.</p> <p><i>This achievement level can be awarded even if a fundamental flaw exists in the instrument used to collect the information, for example, a faulty questionnaire or an interview conducted in an invalid way.</i></p>
2	<p>The relevant information collected, or set of measurements generated by the student, is organized in a form appropriate for analysis or is sufficient in both quality and quantity.</p> <p><i>A satisfactory attempt has been made to structure the information/measurements ready for the process of analysis, or the information/measurements are adequate in both quantity and quality.</i></p>
3	<p>The relevant information collected, or set of measurements generated by the student, is organized in a form appropriate for analysis and is sufficient in both quality and quantity.</p> <p><i>This level cannot be achieved if the measurements/information are too sparse (that is, insufficient in quantity) or too simple (for example, one-dimensional) as clearly it does not lend itself to being structured. It should therefore be recognized that within this descriptor there are assumptions about the quantity and, more importantly, the quality (in terms of depth and breadth) of information or measurements generated.</i></p>

Criterion C: Mathematical processes

When presenting diagrams, students are expected to use rulers where necessary and not merely sketch. A freehand sketch would not be considered a correct mathematical process. When technology is used the student would be expected to show a clear understanding of the mathematical processes used.

Achievement level	Descriptor
0	<p>The student does not attempt to carry out any mathematical processes.</p> <p><i>This would include students who have copied processes from a book with no attempt being made to use their own collected/generated information.</i></p> <p><i>Projects consisting of only historical accounts, for example, will achieve this level.</i></p>
1	<p>The student carries out simple mathematical processes.</p> <p><i>Simple processes are considered to be those that the average mathematical studies student could carry out easily, for example, percentages, areas of plane shapes, linear and quadratic functions (graphing and analysing), bar charts, pie charts, mean and standard deviation, simple probability. This level does not require the representation to be comprehensive, nor does it demand the calculations to be without error.</i></p>
2	<p>The simple mathematical processes are mostly or completely correct, or the student makes an attempt to use at least one sophisticated process.</p> <p><i>Examples of sophisticated processes are volumes of pyramids and cones, analysis of trigonometric and exponential functions, optimization, statistical tests and compound probability. For this level to be achieved it is not required that the calculations for the sophisticated process(es) be without error.</i></p>
3	<p>The student carries out at least one sophisticated process, and all the processes used are mostly or completely accurate.</p> <p><i>The key word in this descriptor is "accurate". It is accepted that not all calculations need to be checked before awarding this achievement level; random checking of some calculations is sufficient. A small number of isolated mistakes should not disqualify a student from achieving this level.</i></p> <p><i>However, incorrect use of formulae, or consistent mistakes in using data, would disqualify the student from achieving this level.</i></p>
4	<p>The student carries out at least one sophisticated process; the processes used are mostly or completely accurate and all the processes used are relevant.</p> <p><i>For this level to be achieved the mathematical processes must be appropriate and used in a meaningful way.</i></p>
5	<p>The student accurately carries out a number of relevant sophisticated processes.</p> <p><i>To achieve this level the student would be expected to have carried out a range of meaningful mathematical processes. The processes may all relate to a single area of mathematics, for example, geometry. Measurements, information or data that are limited in scope would not allow the student to achieve this level.</i></p>

Criterion D: Interpretation of results

Use of the terms “interpretations” and “conclusions” refers very specifically to statements about what the mathematics used tells us after it has been used to process the original information or data. Wider discussion of limitations and validity of the processes is assessed elsewhere.

Achievement level	Descriptor
0	<p>The student does not produce any interpretations or conclusions.</p> <p><i>For the student to be awarded this level there must be no evidence of interpretation or conclusions anywhere in the project, or a completely false interpretation is given without reference to any of the results obtained.</i></p>
1	<p>The student produces at least one interpretation or conclusion.</p> <p><i>Only minimal evidence of interpretations or conclusions is required for this level. This level can be achieved by recognizing the need to interpret the results and attempting to do so, but reaching only false conclusions.</i></p>
2	<p>The student produces at least one interpretation and/or conclusion that is consistent with the mathematical processes used.</p> <p><i>For this level to be achieved at least one interpretation and/or conclusion is required. A “follow through” procedure should be used and, consequently, it is irrelevant here whether the processes are either correct or appropriate; the only requirement is consistency.</i></p>
3	<p>The student produces a comprehensive discussion of interpretations and conclusions that are consistent with the mathematical processes used.</p> <p><i>To achieve this level the student would be expected to produce a meaningful discussion of the results obtained and the conclusions drawn. In this context, the word “comprehensive” should be taken to mean thorough and detailed discussion of interpretations based on the level of understanding reasonably to be expected from a student for mathematical studies SL.</i></p> <p><i>This achievement level cannot be awarded if the project is a very simple one, with few opportunities for substantial interpretation. This level would not be achieved with too many incorrect interpretations or conclusions present.</i></p>

Criterion E: Validity

An important distinction is drawn between interpretations and conclusions, and validity. Validity addresses the questions as to whether appropriate mathematics was used to deal with the information collected and whether the mathematics used has any limitations in its applicability within the project. Any limitations or qualifications of the conclusions and interpretations should also be judged within this criterion. The considerations here are independent of whether the particular interpretations and conclusions reached are correct or adequate.

Achievement level	Descriptor
0	<p>The student does not comment on the mathematical processes used or the interpretations/conclusions made.</p> <p><i>There is no attempt to evaluate (as opposed to interpret) the project to assess the validity of the mathematical processes or model used.</i></p>
1	<p>The student has made an attempt to comment on either the mathematical processes used or the interpretations/conclusions made.</p> <p><i>The student shows an awareness of the possibility that some or all of the results may have a limited validity and makes an attempt to discuss the reasons for such limitations.</i></p> <p><i>Statements merely acknowledging the need for more information/measurements, but with no further evaluation, belong in this achievement level. If it is believed that validity is not an issue, this must be stated with at least some reasonable justification for the belief.</i></p>
2	<p>The student has made a serious attempt to comment on both the mathematical processes used and the interpretations/conclusions made.</p> <p><i>There is significant discussion of the validity of the techniques used, recognition of any limitations that might apply and at least one realistic suggestion for improvement. A statement such as "I should have used more information/measurements" without further clarification, is not sufficient to earn full marks for this criterion. If the student considers that validity is not an issue, this must be fully justified, and can only achieve this achievement level if the argument is reasonable.</i></p> <p><i>If the discussion of validity is clearly worth achievement level 1 and is then supplemented with sensible suggestions for extension of the project, this can also assist in the achievement of this level though such suggestions alone are not adequate if there is no discussion of validity.</i></p>

Criterion F: Structure and communication

The term “structure” should be taken primarily as referring to the organization of the information, calculations and interpretations in such a way as to present the project as a logical sequence of thought and activities starting with the task and the plan, and finishing with the conclusions and limitations.

The term “communication” refers primarily to the correct and effective use of mathematical notation and sensible choice of diagrammatic and tabular representations. It is not expected that spelling, grammar and syntax are perfect and these features are not judged in assigning a level for this criterion. Nevertheless, teachers are strongly encouraged to correct and assist students with the linguistic aspects of their work. Projects that are very poor linguistically are also less likely to excel in the areas that are important in this criterion.

Achievement level	Descriptor
0	<p>The student has made no attempt to structure the project.</p> <p><i>It is not expected that many students will be awarded this level.</i></p>
1	<p>The student has made some attempt to structure the project or has used appropriate notation and terminology.</p> <p><i>There must be a logical development to the project or the appropriate notation and terminology must be used correctly.</i></p>
2	<p>The student has made some attempt to structure the project and has used appropriate notation and terminology.</p> <p><i>There must be a logical development to the project and the appropriate notation and terminology must be used correctly.</i></p>
3	<p>The student has produced a project that is well structured and communicated in a coherent manner.</p> <p><i>To achieve this level the project would be expected to read well, and contain footnotes and a bibliography, as appropriate.</i></p>

Criterion G: Commitment

The project should be an ongoing process involving consultation between student and teacher. The student should be aware of the expectations of the teacher from the beginning of the process and each achievement level awarded should be justified by a written comment from the teacher at the time of marking. The examples given below for each criterion level are teacher orientated and each teacher should use discretion when judging the levels.

Achievement level	Descriptor
0	<p>The student showed little or no commitment.</p> <p><i>For example, the student did not participate in class discussions on project work, did not submit the required work in progress, and/or missed many deadlines.</i></p>
1	<p>The student showed satisfactory commitment.</p> <p><i>For example, the student participated in class discussions on project work, kept to most deadlines, had some discussion initiated by the teacher but did not necessarily exploit all the available opportunities for the development or improvement of the project.</i></p>
2	<p>The student showed full commitment.</p> <p><i>For example, the student participated fully in class discussions on project work, took initiatives both in discussion with the teacher and/or the rest of the class and in subsequent work of a more independent nature and/or demonstrated a full understanding of all the steps in the development of his/her project.</i></p> <p><i>To obtain the highest achievement level for this criterion the student should have excelled in several areas such as those listed below. This list is not exhaustive and teachers are encouraged to add their own expectations.</i></p> <p><i>The student:</i></p> <ul style="list-style-type: none"> • <i>actively participated at all stages of the development of the project</i> • <i>demonstrated a full understanding of the concepts associated with his/her project</i> • <i>participated in class activities on project work</i> • <i>demonstrated initiative</i> • <i>demonstrated perseverance</i> • <i>showed insight</i> • <i>prepared well to meet deadlines set by the teacher.</i>